



FUSION SERIES

Circuit Protection Surge Arrestors

Data Specification **2023**



AUSTRALIA WIDE DELIVERY
Expedited delivery to all states in Australia



SAME DAY DISPATCH
Orders prior to 12PM will be dispatched the same day



5 YEAR WARRANTY
You can get a trusted 5 Year In House Warranty with CSG

[DESCRIPTION]

The FUSION Series range of surge arrestors have been designed to comply with IEC 61643.1 and are made from the highest grade components to ensure reliability in all applications where protection against lightning strikes and power surges is required. The feature and design of these surge protectors make them the perfect compliment to ensure your home or sensitive equipment is protected. They have a high discharge capacity and are able to detect surges in nano seconds. Replacement insert modules are also available on our previous range of surge protectors.

[FEATURES]

- DIN Rail Plug In Format
- Fail Safe Self Protected Design
- Optional Remote Signaling
- Suitable for all stages of Protection in Supply Distribution Panels
- PE Connection Terminal for Installations > 10m from MEN Link
- Available in Type 1+2/Type 2/Type 2+3/Type 3

[TECHNICAL PARAMETERS]

- Rated Voltage: 275V/320V/385V/420V AC
- Rated Frequency: 50/60Hz
- Cable Termination: 10mm²
- Torque of Screw: 1.2Nm
- Discharge Capacity with a 10/350 μ s, 8/20 μ s or 1.2/50 μ s Waveform

[COMPLIANCE]

IEC 61643

[IMAGES]



SP1320-10F



SP2275-25



SP3420-40



SP4420-40P



SP6420-25



SP8420-25P

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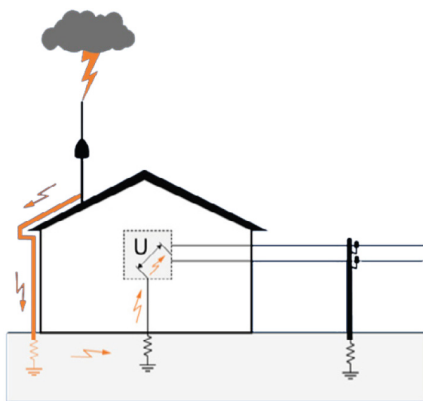
[TYPES OF SURGES]

Surges are transient over voltages that can reach tens of kilovolts with durations in the order of microseconds. Despite their short duration, the high energy content can cause serious problems to equipment connected to the line like premature ageing of electronic components, equipment failure or disruptions to services.

There are two main types of surges - conduction and induction.

Conduction

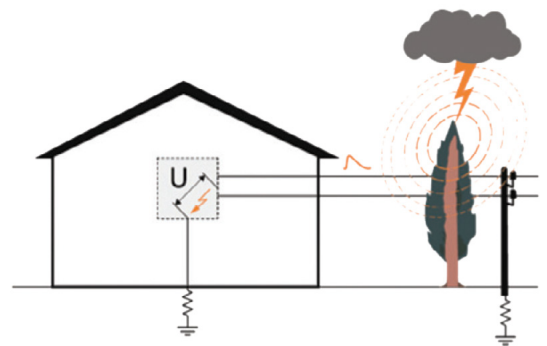
Conduction or 10/350 μ s simulates energy from lightning direct impact



Current Wave 10/350

Induction

Induction or 8/20 μ s simulates energy from indirect lightning impact



Current Wave 8/20

IMPORTANT

Don't confuse this kA rating with the fault levels of the installation. Fault ratings given by the transformer are kA for 1 second. Surge kA rates are for micro seconds. Protection in front of surge will be based on this statement.

[WHEN THE N-PE POLE IS REQUIRED]

Surge Protection Devices (SPDs) are installed before electrical equipment in a position that allows the SPD to allow a low impedance path to earth that will mitigate the effects of excessive voltages on the downstream equipment.

In the case of TNC-S wiring systems, the neutral conductor is directly connected to earth (MEN link). If an SPD is installed within 10 metres of this MEN link, only a 3 pole SPD is required.

If an SPD is installed further than 10 metres from a MEN link, a 4 pole SPD with PE terminal is required.

[CLASSIFICATION OF SPDs]

Type 1

- Tested with a 10/350 μs waveform (Class I test), which stimulates the current produced by a direct lightning strike.
- Ability to discharge very high currents to earth, providing a high U_p voltage protection level.
- Must be accompanied by downstream Type 2 protectors. Designed for use in incoming power supply panels where the risk of lightning strike is high.

Type 2

- Tested with an 8/20 μs waveform (Class II test), which stimulates the current produced in the event of a switching or lightning strike on the distribution line or its vicinity.
- Ability to discharge high currents to earth, providing a medium U_p voltage protection level. Designed for use in distribution panels located downstream of Type 1 protectors or in incoming power supply panels in areas with low exposure to lightning strikes.

Type 3

- Tested with a combined 1.2/50 μs - 8/20 μs waveform (Class II test), which simulates the current and voltage that can reach the equipment to be protected.
- Ability to discharge medium currents to earth, providing a low U_p voltage protection level. Always installed downstream of a Type 2 protector. Designed to protect sensitive equipment or equipment located more than 20m downstream of the Type 2 device.

[SPD Parameters]

U_p Level of Protection	Maximum residual voltage between the terminals of the protection device during the application of a peak current
I_n Nominal Current	Peak current in 8/20 μs waveform the protection device can withstand 20 times without reaching end of life
I_{max} Maximum Discharge Current	Peak current with 8/20 μs waveform which the protection device can withstand
U_c Maximum Continuous Operating Voltage	Maximum effective voltage that can be applied permanently to the terminals of the protection device
I_{imp} Impulse Current	Peak current with 10/350 μs waveform which the protection device can withstand without reaching end of life

[SPD PLACEMENT]

How to start the SPD design:

The main switchboard is the place to start the design of SPDs on the network.

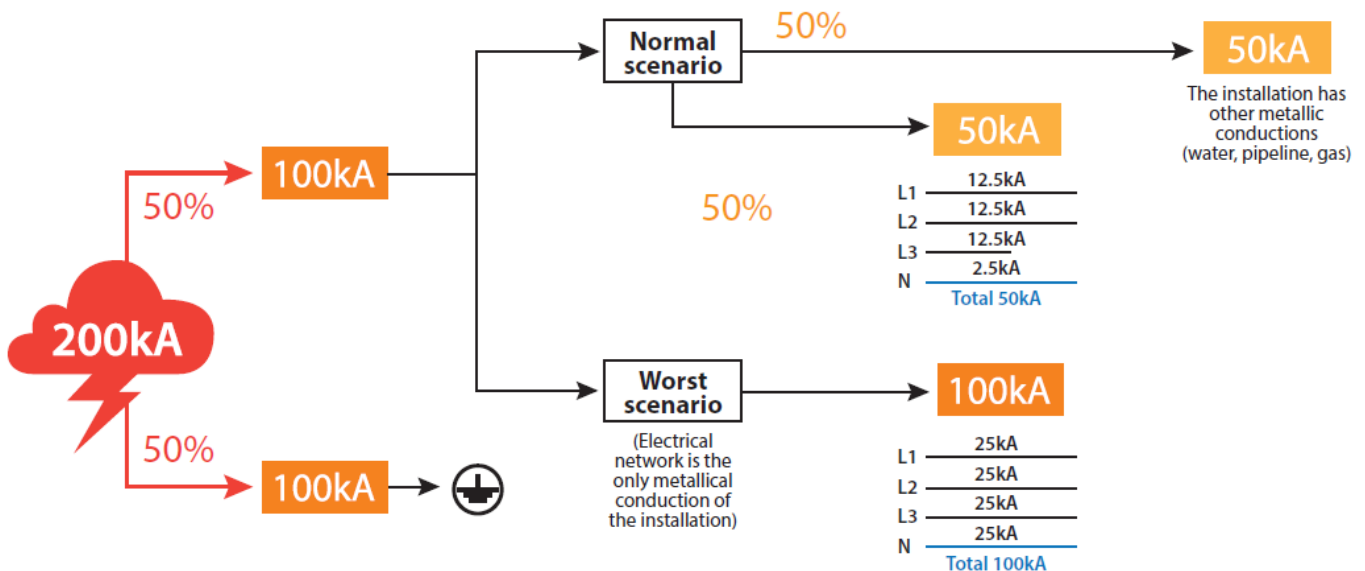
The SPD protection design depends on the level of exposure in front of surge. The diagram below from IEC 63205-1 standard displays the dispersion of the highest lightning considered - 200kA @ 10/350 μ s.

In the worst case scenario, 50% of this energy is conducted away to earth leaving 100kA potential across the networks 3 phase and neutral.

Here a 25kA @ 10/350 μ s (I_{imp}) Type 1 SPD is highly recommended for cases when lightning strikes on or close to the building's earth connection - in particular when a building has a lightning rod.

In a normal scenario, it is assumed that any direct lightning strike to the network will be at such a distance from the installation that another 50% of the energy is dispersed to earth via other conductors before entering your point of connection. In this scenario, a device with a 12.5kA @ 10/350 μ s (I_{imp}) Type 1 is recommended. Furthermore, based on the IEC 61643-12 standard, 12.5kA is the minimum kA rating when a Type 1 is needed.

If the level of exposure of the installation is lower than above described scenarios Type 2 SPD (I_{max}) may be considered along with risk and cost of equipment and downtime.



Do we need to include more SPDs in the distribution boards?

The IEC 60634-4-443 standard classifies electrical devices in categories depending on how sensitive they are to the surge over voltage (U_e). Category 1 devices (electronic receivers) are the most sensitive, U_e has to be at least 1.5kV. Whereas Category 4 devices can withstand 6kV or more. Generally, components in main switchboards are Category 4 devices ie ACB, MCCB etc.

[THIRD STAGE OF SURGE PROTECTION DEVICES]

Do I need to install a third stage of surge protection devices?

A third stage of surge protection installed at the final load may be considered depending on what load it is, how critical, expensive, cost of downtime and sensitive it is. If the cost of the equipment and/or downtime is high then installing a third stage Type 3 (1.5/50µs) device will further reduce the risk of any lasting surge energy getting to your equipment. These include applications such as hospitals, data centres, airports, banking, insurance and transportation.

[SURGE PROTECTION SELECTION GUIDE]

First Stage of Surge Protection

Main Switchboard

Does the building have an external lightning protection? (Lighting rod)



YES

Conducted Lightning Energy

- Direct lightning strike to building
- Lightning Rod

NO

Worst case as per IEC 61643

Because the lightning rod increases the likelihood of a lightning strike and secondly as the strike is a local maximum proportion of the energy will enter the supply.

Use I_{imp} 25kA (10/350 µs waveform)

Type 1 + 2 - 25kA

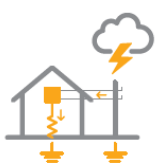
Phase	SPD Distance from M.E.N Link	Poles	CSG Part Code
Single Phase	<10m	L-N	SP2275-25
	>10m	L-N+PE	SP2275-40P
Three Phase	<10m	L-L-L-N	SP3420-40
	>10m	L-L-L-N+PE	SP4420-40P



Parameters per Range

I_{imp}	25 kA
I_{max}	100 kA
I_n	200 kA
U_p	≤1.5 kV

Does the building have overhead supply or is in a region with greater than 2.2 lightning flashes per km² per year?



YES

Conducted Lightning Energy

- Direct lightning strike to overhead lines but at a distance

NO

Normal case as per IEC 61643

It is assumed that it is less likely the energy from a lightning strike will enter the supply and if it does, a greater percentage of the energy will already have been diverted to earth by other conductors

Use I_{imp} 12.5kA (10/350 µs waveform)
Consider upgrading to I_{imp} 25kA

Type 1 + 2 - 12.5kA

Phase	SPD Distance from M.E.N Link	Poles	CSG Part Code
Single Phase	<10m	L-N	SP1275-12
	>10m	L-N+PE	SP1320-20P
Three Phase	<10m	L-L-L-N	SP3420-12
	>10m	L-L-L-N+PE	SP4420-12P

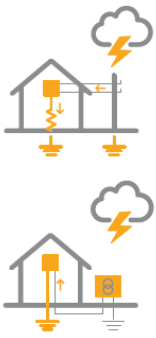


Parameters per Range

I_{imp}	12.5 kA
I_{max}	65 kA
I_n	20 kA
U_p	≤1.5 kV

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Underground mains supply



YES

Induced Surge Events

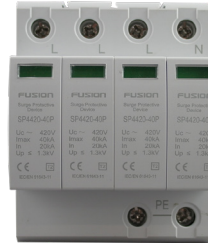
- Cloud to cloud lightning
- Supply network switching
- Inductive/capacitive loads

It is assumed that no energy from a lightning strike will directly enter the supply

Use I_{max} 40kA
(8/20 μ s waveform)
Consider upgrading to I_{imp} 12.5kA

Type 2 - 40kA

Phase	SPD Distance from M.E.N Link	Poles	CSG Part Code
Single Phase	<10m	L-N	SP1275-40
	>10m	L-N+PE	SP2275-40P
Three Phase	<10m	L-L-L-N	SP3420-40
	>10m	L-L-L-N+PE	SP4420-40P



Parameters per Range

I_{max}	40 kA
I_n	20 kA
U_p	≤ 1.3 kV

Second Stage of Surge Protection

Distribution Board

Type 2 - 40kA

Phase	SPD Distance from M.E.N Link	Poles	CSG Part Code
Single Phase	<10m	L-N	SP1275-40
	>10m	L-N+PE	SP2275-40P
Three Phase	<10m	L-L-L-N	SP3420-40
	>10m	L-L-L-N+PE	SP4420-40P

Parameters per Range

I_{max}	40 kA
I_n	20 kA
U_p	≤ 1.3 kV



[SPECIFICATIONS]

Product Code	Type	No. of Phases	Width (in multiples of 18mm)	I_{imp}	I_{max}	Connection	I_n	U_c	U_p
SP1275-12	1+2	1	1	12.5 kA	65 kA	L-N	25 kA	275V	<1.5 kV
SP2275-25	1+2	1	2	25 kA	100 kA	L-N	25 kA	275V	<1.5 kV
SP2275-12P	1+2	1	2	12.5 kA	65 kA	L-N-PE	25 kA	275V	<1.5 kV
SP3420-12	1+2	3	3	12.5 kA	100 kA	L-L-L-N	25 kA	420V	<1.5 kV
SP6420-25	1+2	3	6	25 kA	100 kA	L-L-L-N	25 kA	420V	<1.5 kV
SP4420-12P	1+2	3	4	12.5 kA	65 kA	L-L-L-N-PE	25kA	420V	<1.5 kV
SP8420-25P	1+2	3	8	25 kA	100 kA	L-L-L-N-PE	25kA	420V	<1.5 kV
SP320-20	2	1	1	-	20 kA	L-N	20 kA	320V	<1.3 kV
SP1275-40	2	1	1	-	40 kA	L-N	20 kA	275V	<1.3 kV
SP2275-40P	2	1	2	-	40 kA	L-N-PE	20 kA	275V	<1.3 kV
SP4275-40P	2	3	4	-	40 kA	L-L-L-N-PE	20 kA	275V	<1.3 kV
SP385-30	2	1	1	-	60 kA	L-N	30 kA	385V	<1.3kV
SP1420-40	2	1	1	-	40 kA	L-N	20 kA	420V	<1.3 kV
SP2420-40P	2	1	2	-	40 kA	L-N-PE	20 kA	420V	<1.3 kV
SP3420-40	2	3	3	-	40 kA	L-L-L-N	20 kA	420V	<1.3 kV
SP4420-40P	2	3	4	-	40 kA	L-L-L-N-PE	20 kA	420V	<1.3 kV

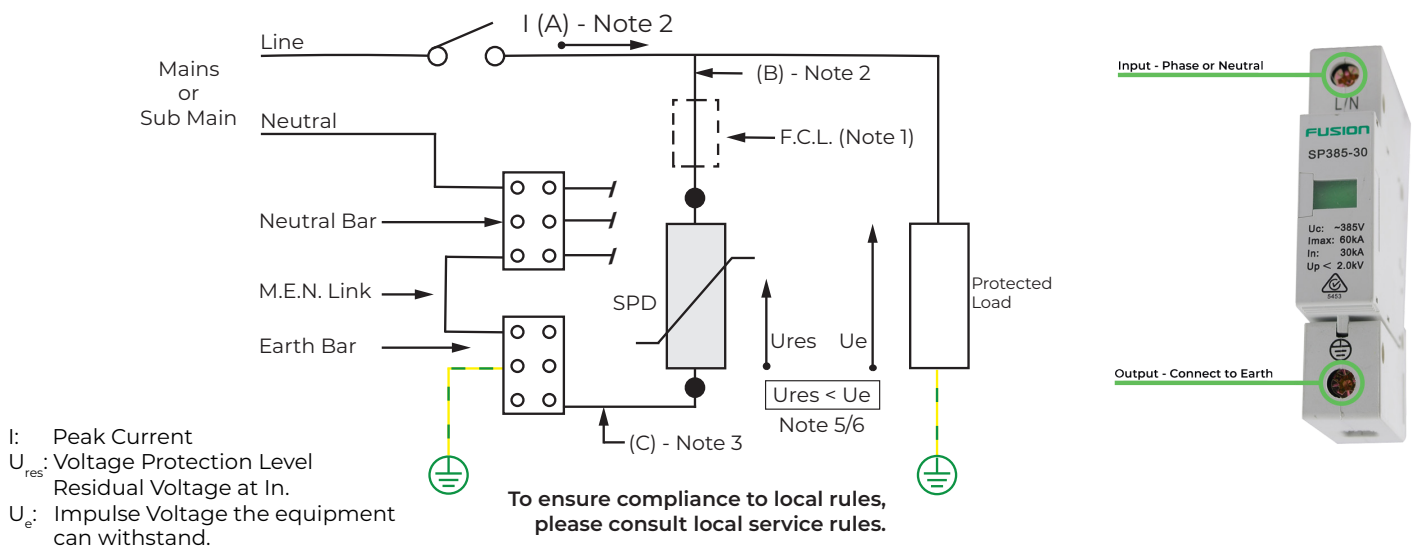
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[SPECIFICATIONS]

Product Code	Type	No. of Phases	Width (in multiples of 18mm)	I_{imp}	I_{max}	Connection	I_n	U_c	U_p
SP1320-20	2+3	1	1	-	20 kA	L-N	10 kA	320V	<1.3 kV
SP1320-20P	2+3	1	1	-	20 kA	L-N-PE	10 kA	320V	<1.3 kV
SP2320-20P	2+3	1	2	-	20 kA	L-N-PE	10 kA	320V	<1.3 kV
SP4320-20P	2+3	3	4	-	20 kA	L-L-L-N-PE	10 kA	320V	<1.3 kV
SP1320-10	3	1	1	-	10 kA	L-N	5 kA	320V	<1.3 kV
SP1320-10P	3	1	1	-	10 kA	L-N-PE	5 kA	320V	<1.3 kV
SP2320-10P	3	1	2	-	10 kA	L-N-PE	5 kA	320V	<1.3 kV
SP1320-10F	3	1	1	-	10 kA	L-N	5 kA	320V	<1.0 kV
SP1320-10PF	3	1	2	-	10 kA	L-N-PE	5 kA	320V	<1.0 kV

Product Code	Description	Type	I_n	U_c
SPM320-20	Replacement Module for SP320-20	2	20 kA	320V
SPM385-30	Replacement Module for SP385-30	2	30 kA	385V

[WIRING DIAGRAM]



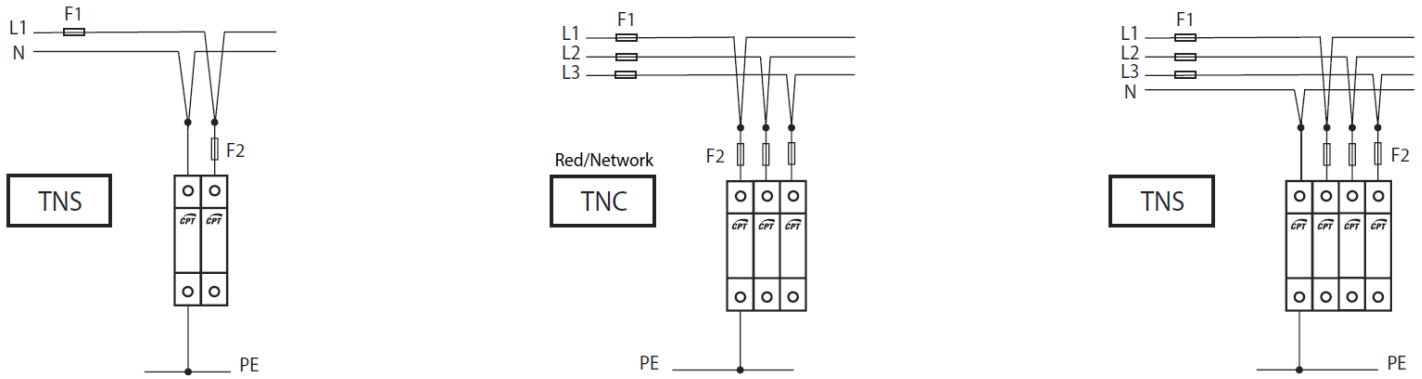
Notes:

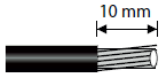
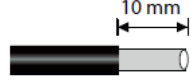
1. Where the Main or Submain's Fault Current Limiter exceeds 100A, an additional F.C.L must be used as shown above (e.g: equal to or less than a 100A HRC Fuse to AS2005)
2. If the Main or Submain Cable(A) exceeds 25mm² cable(B) must not be less than 16mm². In all other cases, cable(B) should be at least 6mm².
3. Wire (C) must not be less than 6mm².
4. Where outbuildings are to be supplied from the main board containing SP Surge Protector, the outbuilding will require its own protection, however SP Surge Protector will be required to protect both Line and Neutral. (In the main building the M.E.N connection protects the Neutral wire.)
5. A transient over voltage protection device acts as a voltage controlled switch and is installed between the active conductors and ground in parallel with the equipment to be protected. When the supply voltage is lower than its activation voltage, the protector acts as a high-impedance element so that no current flows through

it. When the supply voltage is higher than the activation voltage, the protector acts as an element with impedance close to zero, diverting the over voltage to earth and preventing it from affecting equipment downstream.

- In the terminals of the SPD there will always be a residual voltage (U_{res}) which is not a fixed rate. Higher surge current leads to higher residual voltage. To protect your electrical equipment, the residual voltage across the SPD, including the wires and connections, needs to be less than the over voltage withstand of the equipment.

[WIRING DIAGRAM]

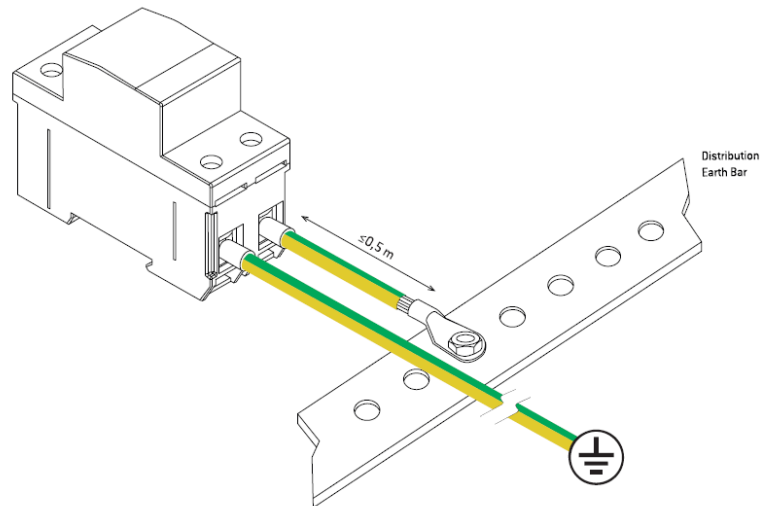


	STRANDED	RIGID
Type of Wire		
Ø min. L,N,PE	6mm ²	
Ø max. L,N,PE	25mm ²	35mm ²

[RECOMMENDED LENGTHS AND CONNECTION TYPES ACCORDING TO IEC 61643-12]

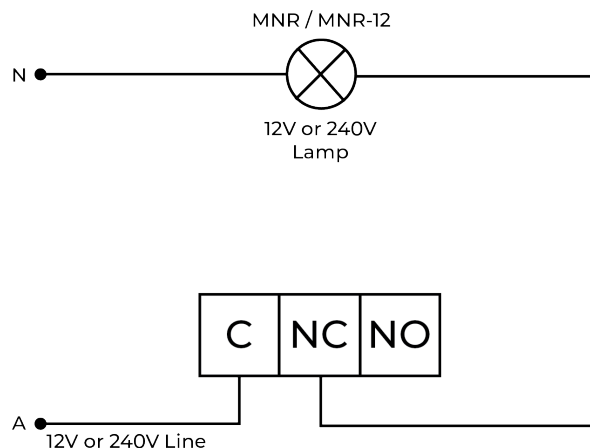
In order to achieve optimum over voltage protection, connecting conductors of SPDs shall be as short as possible. Long lead lengths will degrade the protection offered by the SPD.

When connection an SPD in parallel, the optional connection is a 'V Type' (see image below). Whenever this is not possible, the maximum derivation cable length should be less than 0.5m.



[OPTIONAL REMOTE SIGNAL FUNCTION]

The use of the optional remote signalling contact ports of the surge arrestors (also known as dry contacts) are primarily used for remote monitoring of the condition of the surge protector cartridge. When a surge protector is damaged, it can output a discrete signal. If a customer wishes to remotely observe the degradation of the surge protector via a computer, this remote signalling terminal can be utilized for monitoring and integrated into their surveillance system. The circuit can be powered by either 240V or 12V power supply with corresponding indicator lamp voltage.



LEGEND

- | | |
|----|-------------------------------------------------------------------------------|
| C | 12V or 240V Line |
| NC | Lamp will continue to glow until either the insert module blows or is removed |
| NO | Lamp will only glow when the insert module is removed or blown |

[WARRANTY]

Connected Switchgear FUSION series of product come with a trusted 5 Year In Replacement Warranty*.

* See our website for full terms and conditions www.connectedswitchgear.com.au

Information in this article has been referenced from <https://www.nhp.com.au/-/media/Project/NHP/Sites/Shared/Brochures/Power-Distribution-and-Protection/CirprotecSurgeProtection-BR-002-EN.pdf>

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